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THE CONTROL OF RABIES.[1]

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Historical Note. Although reference is made to a disease in dogs, which was no doubt rabies, by Aristotle, as long ago as the fourth century before the Christian era, and distinct epidemics of the disease were recognized as far back as the beginning of the seventeenth century, it was not until about 1875 that it was demonstrated that the disease could be markedly limited in its spread and probably entirely stamped out. Accordingly at about that time several nations adopted rigid regulations for the control of the disease. Such nations have been abundantly rewarded; the disease no longer existing in Great Britain, Norway, Sweden, nor Denmark. With such a remarkable demonstration of the efficacy of a preventive measure it seems indeed strange that most of our civilized nations have not yet adopted measures which if carried out may be relied upon to exterminate the disease. This in face of the fact that, taken the world over, the disease is apparently on the increase.

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[1] Read at the Fifteenth International Congress on Hygiene and Demography, Washington, D. C., September, 1912.

Prevalence of Rabies in the World at the Present Time. Rabies is a very widespread disease. With the exception of Australia there is not a continent which is free from it. It is apparently most prevalent in the countries of Europe adjacent to the Mediterranean Sea. On account of the fact that in most countries the disease is not reportable, except as it causes the death of a person, it is impossible to obtain even fairly accurate data as to the number of cases of rabies now in existence. The figures presented in the following table give therefore only an approximate idea as to the number of persons who are annually bitten by rabid or presumably rabid animals:

Number of Persons Bitten by Rabid or Presumably Rabid Animals in Various Countries.

Country.	Number.	Year.	As determined by the number of persons who received the Pasteur antirabic treatment at:
Argentina	417	Average of past twenty-four years	Buenos Aires.
Australia	...[2]		
Austria	452	Average of 1907 and 1908	Vienna.
Brazil	583	1911	Sao Paulo
Bulgaria	1027	1911	
Canada	...[3]		
Denmark	0	For past fifty years	
France	467	1909	Paris.
Germany	374	1909	Berlin and Breslau.
Great Britain	0	Since 1902	
Hungary	806	Average 1890 to 1908	Budapest.
Holland	...[4]	Since 1879, except along the Belgian border	
India	2073	1910	Kasauli.
Italy	3537	1900	Rome, Milan, and Turin.
Philippine Islands	54	Year ending June 30, 1911	Manila.
Portugal	1672	1911	Lisbon.
Russia	3520	1909	St. Petersburg and Charkaw.
Spain	649	1911	Madrid and other places.
Sweden	0	Since 1870	
Switzerland	0	1911	
Turkey	978	1908	Constantinople.
United States	4625	1911	

Prevalence of Rabies in the United States. In 1900, Salmon[5] reported that there had been 230 deaths of human beings from rabies in 73 of the principal cities of the United States, from 1890 to 1899.

According to the mortality statistics of the Bureau of the Census the number of deaths of human beings from rabies in the registration area of the United States was 33 in 1900, the number gradually increasing to 85 in 1906, and falling to 75 in 1907.

The Public Health and Marine Hospital Service made an exhaustive study[6] into the prevalence of the disease in the United States in 1908. According to their findings, rabies was present in

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[2] Never introduced.
[3] Never introduced.
[4] Few cases.
[5] Salmon, D. E. Year-book, Dept. Agri., 1900.
[6] Kerr and Stimson. Jour. Amer. Med. Assoc., September 25, 1909, liii, 989.

534 localities distributed throughout the United States, with the exception of 10 States; there occurred 111 deaths of human beings and about 1500 persons received the Pasteur antirabic treatment.

During the past few months I have collected the data relative to the prevalence of the disease in the United States during the year 1911. Data were also collected by the Public Health and Marine Hospital Service.[7] Such data have been combined in the form of the following table:

States.	Infected localities.		Persons treated in	Disease on increase or decrease—determined by comparing number of cases of the disease in 1911 with those of the previous three years.			Possess State regulation for the control of rabies in dog.
	1908	1911	1911	Increase.	Decrease.	Uncertain.	
Alabama	13	47	281	*			
Arizona	1	1	1	..	*	..	*
Arkansas	5	18	29	*			
California	..	49	124	*			
Colorado	1	10	10	*			
Connecticut	7	11	8	..	..		
Delaware	5	15	22	*			
District of Columbia	1	1	41				
Florida	11	36	128	*			
Georgia	17	4	457	*			
Idaho							
Illinois	18	35	292	*			
Indiana	57	62	104	*			
Iowa	5	29	92	*			
Kansas	4	86	175	*			
Kentucky	7	14	24	*			
Louisiana	3	61	233	*			
Maine							
Maryland	12	59	122	..	..	?	
Massachusetts	9	45	27	..	*		
Michigan	11	46	58	*			
Minnesota	18	31	117	..	..	?	
Mississippi	10	34	51	*			
Missouri	9	52	187	*			
Montana							
Nebraska	5	..	..	..	..	?	
Nevada							
New Hampshire	7	3	2	..	*		
New Jersey	41	68	189	*			
New York	52	38	899	..	*	..	*
New Mexico							
North Carolina	19	96	166	*			
North Dakota	2	12	15	*			
Ohio	32	91	275	*			
Oklahoma	6	51	106	*			
Oregon	..	3	1	..	*		
Pennsylvania	25	52	46	..	*	..	*
Rhode Island	10	4	5	*			
South Carolina	5	32	114	*			
South Dakota	2	7	14	..	..	?	
Tennessee	7	16	13	*			
Texas	15	..	..	..	..	?	
Utah							
Vermont	1	..	0	..	*	..	*
Virginia	37	48	54	..	..	?	
Washington	..	7	2	*			
West Virginia	2	21	30	*			
Wisconsin	42	83	112	..	..	?	
Wyoming	..	3	4	*			
Total	534	1381	4625	27	7	7	4

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[7] Stimson, Public Health Reports, July 12, 1912, vol. xxvii, No. 28.

A comparison of the distribution of rabies in the United States in 1908 and 1911 indicates that during the last three years:

1. There has been an increase of rabies in the United States, as indicated by the fact that during 1908 there were 534 infected localities and about 1500 persons received the Pasteur antirabic treatment, whereas in 1911 there were 1381 infected localities and 4625 persons received the treatment.
2. The increase has occurred principally in the Southern and Middle Western States, very few of which have any State regulations concerning the muzzling and movement of dogs.
3. There has been a decrease in the number of cases in most of the New England States, where since the epidemic of rabies several years ago regulations aiming at the control of the disease in dogs have been rather rigidly enforced. In Rhode Island the relaxation in the enforcement of muzzling regulations during the past two years is causing a distinct increase in the number of cases.
4. The disease is somewhat on the increase in the far west, more especially in California. It is believed by some that the spread of rabies in Arizona is due principally to the bite of skunks. With the object of controlling the disease a bounty is being paid for skunks in that State. The secretary of the State Board of Health of Montana informed me that so far as known there has never been a case of rabies within its borders. It would be unfortunate if the disease should gain a foothold among the wild animals of the west, as it has done in some countries.

It is well understood that infection with rabies takes place almost only through a wound, such as the bite of an animal, and that, although any of the warm-blooded animals may be affected, the dog is by far the principal offender.

METHODS WHICH MAY BE EMPLOYED FOR THE CONTROL OR ERADICATION OF RABIES. *Immediate Local Treatment.* The development of the disease can be largely prevented by treatment of the wound with some caustic, preferably nitric acid. Cauterization should, of course, be done as soon as possible after the wound is inflicted. Experiments performed in the research laboratory of the New York City Department of Health indicate that the application of nitric acid is of value even if such application be delayed for twenty-four hours. Dr. Park believes that "in the case of small wounds all the treatment probably indicated will be thorough cauterization with nitric acid within twelve hours from the time of infection."

Pasteur Antirabic Treatment. The Pasteur treatment has largely robbed rabies of its terrors. Previous to 1886, when the treatment was first begun at the Pasteur Institute in Paris, the mortality from rabies of persons bitten by rabid or presumably rabid animals was 16 per cent. (Leblanc). Since that time more than 30,000 persons have received the preventive treatment at the Paris Institute, with a mortality of only 0.5 of 1 per cent. The Pasteur treatment is given in most of the countries of the globe, and through the Public Health Service is made available in every State of the United States. The results at other institutes have been practically the same as those of the institute at Paris. However efficient this treatment has been in preventing the development of the disease in infected individuals it is probable that the safety assured by the treatment has caused a relaxation in the enforcement of regulations aiming at the control of the disease in dogs and other lower animals. Dr. T. Murillo recently informed me that he believes that for the reason mentioned there are more cases of rabies in Spain at the present time than there were twenty years ago.

Accurate Diagnosis. In practically all countries the clinical diagnosis is confirmed whenever possible by a laboratory examination, consisting of a search for Negri bodies or of an animal inoculation, or both. The mistake that is often made is the killing of the animal so soon as rabies is suspected. If the animals are detained and watched for the development of the disease instead of being killed it will be found that some of the Pasteur treatment which is now being given is unnecessary, but at the present time advisedly administered.

Regulations Aiming at the Control of Rabies in Dogs and Other Lower Animals. Although rabies may be transmitted by the bite of any of the warm-blooded animals the disease is propagated principally by dogs. For that reason regulations aiming at the eradication of the disease, with but occasional exceptions, must be aimed at dogs. The enforcement of the following measures may be relied upon to cause the extermination of rabies:

Licensing. Stray ownerless dogs are the principal offenders, not only in spreading rabies, but in doing harm to live stock. Irrespective of the presence of rabies in a community all dogs ought to be licensed and provided with a collar and license tax and all stray dogs destroyed in a humane manner. The expense of enforcing such a license rule may be maintained by the dog-license fees. The rule has been enforced in England and in the other countries from which rabies has been eradicated. The present decline of the disease in Paris is attributed by Dr. Letulle to the strict enforcement of the regulations regarding the capture of stray dogs.

Muzzling. Wherever rabies is present in a given place all dogs permitted to run at large should be kept muzzled for a period of at least six months after the disappearance of the last case from the locality. There is a difference of opinion as to the size of the territory in which dogs should be muzzled whenever the disease appears. Certainly it should not be less than a city of moderate size, or in rural communities it should in the United States not be less than an average-sized township. If several cases occur at places several miles apart it is advisable to have the regulations enforced over an area corresponding to a county. If the disease is widespread it is certainly best to have the dogs of an entire State muzzled. The muzzling of dogs is the most important measure in preventing the spread of rabies in a community where the disease exists. In the larger cities of Germany dogs permitted to run at large are always muzzled. The objection to muzzling comes from many well-meaning people who believe that it is cruel. It is not cruel to place a properly constructed (such as the basket type, made of metal) and well-fitting muzzle on a dog. Such a muzzle will permit the dog to open its mouth, pant, and drink, but not to bite. It is no more cruel to put a muzzle on a dog than a bit in a horse's mouth. Of course the dog will resent it at first; so does the horse resent the bit. But once they become accustomed to it they do not mind it. The good effect of this procedure has been demonstrated many times and in many places. Probably the best example is the result brought about in England, as is well shown by the following table:

NUMBER OF CASES OF RABIES IN GREAT BRITAIN.

Year.	Number of cases. Dog.	Number of cases. Human.
1887	217	20
1888	160	14
1889	312	30
Muzzling enforced:		
1890	129	8
1891	79	7
1892	38	6
Opposition to muzzling; ordinance relaxed:		
1893	93	4
1894	248	13
1895	672	20
Muzzling again enforced:		
1896	438	8
1897	151	6
1898	17	2
1899	9	0
1900	6	0
1901	1	0
1902	13	0
1903–07	0	0

Note that with the enforcement of the muzzling law the number of cases of rabies rapidly declined from 217 in 1887 to 38 in 1892. In 1892 the authorities yielded to the petition of "dog lovers" and permitted muzzling to be discontinued. As a result the disease rapidly increased in number, so rapidly that during the third year (1895) 672 dogs and 20 human beings died from rabies. The muzzling law was again enforced, the number of cases rapidly decreased, and in 1902 entirely disappeared. Since that time no case of rabies has been recognized in Great Britain. Dogs are not muzzled in England at the present time, but we are informed that muzzling will be resumed with the appearance of a single new case of the disease. The existence of a muzzling act should require all dogs not muzzled to be killed by the proper health or police authorities. In some places the right to kill any unmuzzled dog is given to any person. If the law held the owner of a dog legally responsible for all damage done by such, muzzling could be enforced much more readily than is the case at present.

Detention of Dogs. Dogs that have been associated with rabid animals, and are therefore probably infected, should be confined to a kennel or shed for a period of not less than three months, and preferably six months. When taken out for exercise they should be muzzled and led in leash. When the disease is prevalent it is best to have all dogs confined. Females in heat should at no time be permitted to run at large.

Destruction of Dogs. All dogs known to be affected by rabies or to have been bitten by rabid animals should be killed. The mistake that is usually made is to kill an animal immediately after that animal has bitten a person, on the suspicion that it may be affected by rabies. The importance of such an error is realized when we remember that it is not always possible to get laboratory evidence of the disease even when it exists. Whenever possible an animal that has bitten a person should be kept confined for a period of ten days. If the disease does not develop nor the animal die within that time it may be safely concluded that rabies does not exist.

Quarantine. To prevent the introduction of rabies into a country, all dogs that are imported should be held in quarantine for a period of six months. Australia owes to a rigid enforcement of such a law the fact that it has never had a case of rabies. England likewise depends on it to keep the country free from the disease. Such quarantine may likewise be applied to the smaller divisions of a country. During a recent outbreak of the disease in Canada it was prohibited to move dogs from the infested area. In Germany a certificate from an official veterinarian is necessary to have a dog moved from one section to another. The Federal Government might impose a quarantine against a given State should the disease become prevalent within its borders.

There are few diseases that can be so easily eradicated as rabies. We have now the knowledge necessary to secure its disappearance. All that we need is action on the part of our authorities, which to be effectual must of course have the coöperation of the general public. The time is now ripe for organized effort to stamp out the disease. It has been done in England and can likewise be done in other insular territories. It has been accomplished in Norway, Sweden, and Denmark, and can likewise be done in other peninsular regions. It is more difficult to rid of rabies, inland countries with extensive land boundaries. Even in these much can be accomplished, as has been demonstrated by Germany, Holland, Canada, and some of the eastern States of the United States. It is hardly to be expected, however, that the disease will be entirely eradicated without coöperative or at least simultaneous action on the part of adjoining States or countries. In the United States the question of State rights requires that the efforts be left largely with the individual States. If every State in which the disease exists would take as vigorous steps to exterminate rabies as were taken in England, and if like action were taken by the countries to the south of us, as has substantially already been done by Canada on the north, it would be possible to remove the last vestige of the disease from the North American continent in the course of a few years. In like manner the disease could be eradicated from other continents.

To exterminate rabies it is necessary that the general public should be better informed than it is at present regarding the disease. The people should be made to realize especially:

That rabies is prevalent in most countries the world over, and that in many places—more especially in parts of the United States—it is distinctly on the increase.

That it is possible to exterminate the disease in the course of a few years by the adoption of easily executed regulations concerning dogs.

That in particular the muzzling of dogs is not a hardship to the animal, and that from a sanitary and economic point of view it is advisable to get rid of all stray or ownerless dogs.

That the eradication of rabies is worth while for economic reasons because of the loss to the live-stock industry.

That efforts at its eradication are many times over justified by the loss of human life and the almost endless amount of worry which is now attached to the bite of a dog.